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Some Notes on the Chemistry of Gas Manufacture.

By Augustus A. Hayes.

The present state of the mechanical arrangements for purifying, storing, and transmitting gas, to the point of consumption, are a monument to the skill and industry of those who have so successfully battled with an invisible highly diffusible agent, and an important ally to refined civilization.

In recurring to the chemical part of this chemico-mechanical manufacture, we do not see the same marks of advance in this department, as in the more strictly mechanical part—a fact apparent in many branches of industry, dependant on the application of two sciences.

Those who are acquainted with the history of the gas manufacture, must be amused by the *cyclical* character of the so-called improvements of to-day, which are now presented to us, as they were to the ancients, with scarcely an added feature ga in theined revolution.

Some of the facts in these notes are old, and in the representation of them, a necessary connection is thereby preserved with the little that is new, while hey will come before those whose training, in a recognized profession, has fitted them to better discuss and apply suggestions they may serve to call to mind.

The basis of the chemical part of this manufacture, is occupied by coals, and a clear conception of the steps of manufacture is aided by a thorough knowledge of these substances. My facts here will rest on personal experiments, made on many hundreds of samples known to be from various places, and also their congeners in composition, though differing in forms.

ON ACALS.

In using the term *coals* instead of *coal* we avoid the error which has clung to this mineral since its discovery, and suggests that the mineralogy full of interest, is the study of Families of oxydized hydrocarbons, as varied as the minerals of any other Family of minerals. In the importance of this branch of study we may make a high claim, as the advance in arts, power, civilization, and even chemical science itself, is largely due to the recent increased knowledge of coals and their application in industrial pursuits. Here, too, is an open field inviting research in its widest sense, where the cultivator cannot fail to be rewarded by discovery and an extension of useful arts.

If we examine samples of coals, from different or even contiguous beds, we at once detect differences in aspect, in texture, hardness, color, and other characters, which necessarily lead us to consider them as distinct bodies, which is lost when we examine more closely.

Thus the important character of relative weight or gravity does not hold in samples, from different beds, but varies so in masses from the same seam or bed, and in hundrkds of trials I have never known the fragments from masses to have an agreement in gravity when delicately compared.

This uneveness in gravity proves varied composition. The eye recognizes in laminated coals this varied matter too, and we find irregular layers of brilliant close textured matter, arranged alternately with dull, fibrous, or less compact form of matter; an observation of importance in connection with the questions of composition and origin—a clear distinction between coals of different beds, and masses from the same bed.

We find also very compact, uniform matter nearly making the whole coal, as in Albertite, and the finer anthracites, jet, etc.

In the cannel coals, so-called, a more even texture occurs in coal from the same bed, while the coals called cannel differ, within limits, as widely as those of laminated coals. The matter forming cannel coals is distinguished from that forming laminated coals by the eye easily, and the eye refers them at once to an origin distinct from that of laminated coals, as a result of mere physical observation.

In connection with the important manufacture which is the subject of these notes, the physical aspects of coals are not important, and these observations are made as a simple appeal to common knowledge for establishing differences so that we may easily pass into a chemical consideration of a mass of facts, sustaining physical observations by the more certain, though less commonly seen, chemical reactions under the influence of heat.

In the gas manufacture we may consider as established, that coals consumed as raw material are composed of the less easily decomposed parts of vegetation, the remains of varied structures, seldom of high order as plants, but of most diverse chemical composition. In the process of mineralization in the basins or depressions, the original material has undergone changes influenced by the kind of exposure before solidification, by agents present, and most essentially by the fineness of the covering within which it is or was contained.

The matter itself, too, after solidification as coal, slowly but constantly changes in the beds, and especially when exposed to air.

A general expression of the chemical change applies to all forms of hydrocarbons—oxidized or not—and is a law. Thus:

The tendency to form gaseous or light vaporous bodies on one part, while more free carbon remains as the other part of the reacting substances, is always observed.

The common observation of peat formation—one of the most striking instances of death as an inevitable result of life—illustrates this law. The spongioles of the thrifty plant are passing through stages of decay, attended by hourly separations of hydrated humus from the parts below the atmosphere; while vigorous growth and reproduction at the surfaces exposed to the influences of light and air, are going on at the same moment of time. The oxydized and hydrated humus falls and consolidates to form one kind of brown coal—its constitution indicates that it never forms the higher of coals—whilst becoming more and more carbonaceous as it takes the form of a bed.

The term Bituminous as applied to designate coals, though long in use, conveys an erroneous impression, especially as it relates to composition. Coals are never bituminous, and true coals are distinguished from other forms of oxydized hydrocarbons, by the absence of bitumen. It is not probable that the compounds constituting coals are of complex composition, the basis—almost entire mass—being a modified humus, mixed with such bodies as are found in the ligneous part of plants, including wax-like and pectose aggregates. Some remains of humus of resinous woods have been observed in particular coals, the highest forms of growth like wood of trees, rarely if ever identified; while the cannel coals show remains of wax producing leaves, and a humus corresponding with that of decayed water plants. The astonishing rapidity of growth—the large product of wax-like matter—extremely finely divided, almost fluid, humus resulting from water-plants in decay, leads to the belief that many coals are the consolidated humus of these plants, growing in tropical or more favorable climates.

[To be continued.]

Two Hundred Years Ago.—The history of coal gas is attended with some strange incidents, which indicate very clearly that for the application of a saientific fact to practical purposes everything must be ready for the innovation, else it will be useless to attempt to force its introduction. The inflammability of gas obtained from coal was a fact well known long before the idea was entertained of turning it to practical use. The miners in the coal regions of Europe were long familiar with the inflammable qualities of the fire-damp, and very correctly attributed it to the gaseous exhalations of the mines. As early as the latter part of the Seventeenth century Dr. Clayton actually made coal gas, and described its properties very correctly. He distilled coal in a retort, and, to use his own words, the result was "phlegm, black oil," and a spirit which he was unable to condense, but which he confined in a bladder. These products would now be designated respectively as water, tar, and illuminating gas. Clayton several times repeated the experiment, and used to amuse his friends by burning the gas as it came from the bladder through holes which he pricked in it with a pin.—Dr. Wahl, in *Am. Exey. and Review*.

Chemical Repertory.

No. 103.—December 2, 1873.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

911. Spontaneous Combustion?—Fire was discovered at 10 P. M. on October 2, among the coal in the yard of the New York Gas Company's works at the foot of East Twenty-first street. The workmen fought the fire till thirty-five minutes past 1 A. M., when the regular department was called upon and quelled the disaster in about an hour.

912. Application of the Sand-Blast.—The most recent application of the sand-blast is for cleaning the fronts of buildings by removing the soot, dust, and other substances therefrom. The impact of the sand on the surface removes the soot or dust from all the crevices and indentations, without perceptibly interfering with the sharpness of the architectural ornamentation.—*Jour. Soc. Arts.*

913. Novel Gas-Kindler.—Prof. Bettger has succeeded in igniting a jet of ordinary coal gas in the following manner: The gas was allowed to issue from a finely-drawn-out glass tube and strike against a few grains of finely-powdered, dust-dry permanganate of potash, which is moistened with concentrated sulphuric acid. The gas ignites with the rapidity of lightning.—*Journal of Applied Chemistry.*

914. Influence of Barometric Pressure on Life.—M. Bert.—When oxygen accumulates to about 30 per cent in the arterial blood (of a dog) it produces convulsions; and the fall of temperature which occurs indicates a profound change in internal nutrition. It is not that the blood becomes a poisonous substance through superoxidation, but that the excess of oxygen in the tissues themselves alters the chemical phenomena of nutrition. Similarly, compressed oxygen hinders the germination of seeds, the putrefaction of fragments of muscle, the change of starch into sugar by saliva, the development of *Mycoderma aceti*, and a number of like phenomena.—*Chemical News.*

915. Water Free from Ammonia.—Being in frequent use of Wanklyn and Chapman's "ammonia process" in water analysis, I have found the preparation of "ammonia-free" water, for comparison, to be a tedious and troublesome operation, especially if required in large quantities; an accidental discovery has, however, relieved me from further inconvenience upon that score. I have in my laboratory a copper drying oven heated by steam from a boiler. The oven is secured against excessive radiation by an outer case of wood, but, notwithstanding this, there is a considerable amount of condensation goes on in the copper jacket of the oven, and I find that the resulting water is free from every trace of ammonia; thus I have a constant supply of water, which only requires cooling to render it fit for even the most delicate determinations. The high temperature at which the steam is condensed is evidently the cause of the purity of the water.—W. F. K. Stock, F.C.S.—*Ibid.*

916. Some Discrepancy.—The consumption of coal for the purpose of gas illumination in Great Britain is estimated at fourteen millions of tons per annum, valued at sixty millions of dollars. The total annual production of coal in England is one hundred millions of tuns.—*Scientific American.*

[We have not the figures by us, but we are sure that the British out put of coal largely exceeds one hundred millions, and in fact has gone up to one hundred and twenty millions. By reference to the figures given by the high authority, J. Lowthian Bell, which we copied in our issue of November 3, p. 170, the coal used for gas-making is but six per cent. of the whole, which appears very discrepant with the above.—Ed.]

917. Connelsville Coke.—Connelsville coal weighs eighty pounds to a bushel, and when properly coked 100 bushels of coal produce 125 bushels of coke, and the coke weighs 40 pounds to a bushel; that is, a given quantity of the coal gains one-quarter in bulk, and loses three-eighths of its weight, or 100 pounds of coal makes 62½ pounds of coke. At the Dunbar Furnace seventy bushels of coke, produced from two gross tons of iron, smelt a ton of pig-iron, but the Pittsburgh furnaces use eighty to eighty-five bushels, the difference being owing, probably, in part at least, to the kinds of ore and limestone used.—*Coal Trade Circular.*

918. Barrels of Glass for Petroleum.—So much loss has occurred from evaporation and leakage in the transportation ann storage of petroleum, and its products—benzine and gasolene—that it is proposed to make barrels of glass, sufficiently heavy to stand the pressure and usage. These, although much more costly at first, would never wear out, and could be cleaned and used for any other fluids indefinitely. An inventor has already obtained a patent for a thick piece of glass inserted into one head of a barrel, on the part next the bung-hole, to allow the quantity within to be viewed by the buyer.

919. Interplanetary Telegraphy.—M. Charles Cros has appealed to the Academy of Sciences to give instructions that during the passage of Venus across the sun's disc, particular search shall be made for intermittent luminous points on Venus's surface, and, if they be discovered, that their positions and the nature of this intermittence be noted. M. Cros insists that there are great probabilities that Venus is inhabited, and may contain astronomers who will presume that that the transit of their planet across the sun may attract terrestrial 'astronomers' attention, and may desire to send them signals. M. Cros declares that several astronomers have observed intermittent luminous points—what sailors call revolving lights—which, as he thinks, may be challenges to terrestrial astronomers to open communieation with them. He proposes to answer this supposed challenge by throwing an immense fasces of luminous rays on these planets The rays would be thrown by parabolic mirrors.

920. Heat-Conducting Power of Rocks.—Prof. Herschel and Mr. Lebour have been experimenting in this subject. Twenty-eight specimens of rocks were reduced to uniform circles of five inches diameter and half inch thickness, carefully gaged. Out of six specimens that had been tried, slate plates, cut parallel to the plane of cleavage, transmitted the heat faster than any of the others. Where the flow of heat had become uniform, the water was raised 1° Fah. in thirty-two seconds. With marble, sandstone, granite, and serpentine, about thirty-nine seconds were required to raise it by the same amount. The greatest resistance to the passage of heat was offered by two specimens of shale, gray and black, from the coal measures in the neighborhood of Newcastle, which occupied forty-eight or fifty seconds in raising the water one degree, or half as long again as the time taken by the plate of slate.—*Scientific American.*

921. Connelsville Coal.—Connelsville coal has become very celebrated not only about Pittsburgh, but throughout the Western States, where it is extensively used for foundry purposes in melting pig-iron, selling in competition with Lehigh coal. It is used in blast-furnaces for smelting iron from the ore, and is sometimes mixed with the Western coals. It is also an excellent fuel for locomotive use. Its freedom from sulphur has given this coke the reputation of being the best known. The Pittsburgh and Connelsville Railroad is a large transporter of the coal and coke of this region, while a portion of it produced near the mouth of the Youghiogheny finds its way to market by the Monongahela River slack-water navigation.—*Coal Trade Circular.*

922. Coal for Domestic Purposes.—With regard to these prizes (see last issue of this Journal, p. 170) it has been decided that testing rooms will be provided, in which the various competing articles may be tested in succession, each competitor having allotted to him in turn a room and chimney, for a limited period, where he may fix his apparatus for the purpose of its being tested by the judges appointed by the Society of Arts, the same to be removed when directed by the judges; such fixing and removal to be at the cost of the competitor. The competing articles must be delivered at the London International Exhibition Building, South Kensington, on the 1st December, 1873, with a view to their being tested, and subsequently shown in the Exhibition of 1874.—*Journal Society of Arts.*

923. Newspaper Statistics.—[We should like much to have the views of the Gas Fraternity upon the following, which we take from the *N. Y. World*. *Fas est ab hoste doceri.*—Ed.]

"The capital in the gas manufacture has grown from $6,674,000 in 1850 to nearly $72,000,000 in 1870. Its gross receipts in that year were over $32,000,000, of which 50 per cent. remained as profits after the costs of labor and materials were deducted, showing a net profit of 20 per cent. upon capital, though it is probable that very little more than 10 per cent. of the capital represented was ever actually paid in. A business which pays and promises to continue to pay 200 per cent. in dividends upon the actual investment is not lightly to be assailed."

924. A Boston Well Water.—J. M. Merrick, B. SC.—A well in this city, unused for fifteen years, was recently opened by the owners on getting short of water, and a sample sent to me for a partial analysis. The water contained

	Grs. to a gallon.
Inorganic matter	4280
Organic and volatile matter	299
Total	1589

The inorganic constituents were lime salts with large amounts of chlorides and nitrates. The well is in a low situation, with a perfect network of drains and sewers around and above it, and the soil has evidently become saturated since the well was last used. I instance this case as being the worst well water I have ever known.—*Amer. Chemist.*

925. The Erie Canal Experiments.—Concerning these trials, from which so much was hoped, the Syracuse *Journal* gives the following conclusions, drawn from remarks made by several of the commissioners:

1. That it is quite impossible to invent any machinery that will propel a boat carrying two hundred tuns at a less cost than when moved by horse power, with the present dimensions of the canal.

2. That boats, as now constructed, are too large for the capacity of the canal, their progress being retarded by natural and well known laws relating to space for the displacement of water.

3. That as the law requires that inventions shall be of a character making them practical for superseding horse power, an award is not likely to follow the test.

4. The law requires a speed of at least three miles an hour; and as none of the boats made that time, an award cannot be legally made.

926. In Advance of the Times. Forty-five years ago a party of gentlemen, at a point on the Cheat river, embracing the farmers who resided there, and near a little town which has since arisen called Albrightsville, which is about 15 miles from the Pennsylvania line, entered into a copartnership for the purpose of putting down a salt well. The hole was to be two inches in diameter, and narrowed at the bottom, as the contractor putting down the well should deem expedient. After the natural delays and embarrassments usually attending such operations in a thinly populated country; and away from all machine shops other than the rude affairs which were improvised by

themselves, a scarcity of money and consequent delays, the hole was finally completed to a depth of 600 feet, when, to the consternation of all present, the well commenced, to use the words of the neighbors then and there collected, to boil out "devil's grease," "black strap," and the like. What to make of it the people did not know, but as a salt well it was considered a grand failure. The rods were left in the well and abandoned.

927. New Gas-Engine at Vienna.—Messrs. Otto & Langen's machine consists of an upright cylinder, open at the top, in which plays vertically a piston having a ratcheted rod, so arranged as in the down stroke to engage a cog-wheel, attached to the axle of the fly-wheel of the machine. The piston, during a small portion of its upward course, takes in the rightly-proportioned mixture of gas and air, which is exploded at the point of the piston's course, where the mixture is shut off. Explosion of the mixture carries the piston upward until the pressure of the external atmosphere stops it. The explosion, depending upon expansion of gases by heat at the instant of combination, is immediately followed by a condensation and partial vacuum in the cylinder. The pressure of the atmosphere upon the piston forces it downward, and the ratcheted rod, engaging the cog-wheel, imparts this force to the fly-wheel. It is claimed for this machine that it is much more economical of gas than M. Lenoir's. The complications incident to the ratchet and cog-wheel arrangement are objectionable; but it is spoken of as having quite an extended use. The consumption of gas is about a cubic meter (39.31 cubic feet) per horse-power per hour. With gas at $2.50 per thousand, this would give ninety-six cents per day per horse-power.—*American Artisan.*

A New Pump—The Pulsometer.

Considerable attention is at present being directed in the United States to an ingenious invention, covered by some 30 patents, in the shape of a steam-pump with no stuffing boxes, glands, cylinder, piston, piston-rod, cams, eccentrics, slide valves, cranks, or fly-wheels, to which the inventor, Mr. C. Henry Hall, of Cortlandt street, New York, has given the name of the pulsometer. In this contrivance the steam and water are brought into direct contact in suitably arranged chambers, whereby the alternate vacuum and pressure of the former the fluid is first lifted and then forced out; in other words, moved by direct acting pulsation—a utilization, it is contended, of the simplest principles of hydrodynamics, by means of one of the simplest forms of machine. From an illustrated description of the pump published in the *Scientific American*, the apparatus, it appears, consists of two long-necked chambers joined together at their upper extremities, forming a common passage, into which a metal ball is fitted, so as to oscillate freely between seats formed at the junction, thereby closing the orifice of either chamber toward which it may fall. Steam enters from above, and hence the position of the ball governs its entrance into one or the other vessel. Water, on the other hand, comes into the apparatus by a pipe from below to the induction passage which connects the lower portion of the two receptacles through circular orifices. In the latter two spherical shells are arranged, and seated so as to act as induction valves to the chambers, and is also provided with a spherical shell, oscillating from side to side between seatings formed in the entrance to the conduits leading into the two chambers, which acts as a delivery valve to each alternately. A vacuum chamber is connected with the induction passage through a downward extension on the side opposite the delivery opening. Suitable flanges and covers are arranged at the bottom of the chambers to allow of the removal of the shell valves when necessary.

The entire apparatus, with all its chambers and passages, is cast in one piece, and at the same time with the induction shell valves in their proper positions, thereby forming their respective seatings, while chills of suitable form are placed so as to mould the seating of the steam and discharge valves also. Stud bolts are similarly cast in their proper positions upon all flanged passages ready for the screwing on of the flanges. As soon, therefore, as the core sand is removed, the flanges bolted on, and the steam and discharge valves put in their places, the pump, after the necessary connections are made, is ready for immediate operation. The working of the pump is as free from complication as the mechanical details. When the ball closing the steam inlet is on its right hand seat the steam has free entrance to the left hand chamber which, with the suction pipes and other chambers, may be supposed to be filled with water. The fluid in the left hand receptacle is, therefore subjected to a pressure directly from above, and the steam is thus applied in a manner to secure the least amount of condensation.

The result is that the water line is gradually depressed, and the liquid forced out past the ball in the lower part of the chamber, and thence out through the discharge opening, the shell in the latter yielding to the pressure, and falling to the right. The shape of the chamber allows the surface steam to expand gradually as the fluid surface is depressed, so that the water is not agitated until the discharging outlet is reached. At precisely that moment agitation commences, the steam mingles and condenses, and, according to the inventor, creates a vacuum. The result of this sudden collapse is that the ball in the steam inlet is drawn over to close the left hand seat, the shell on the delivery conduit falls also back to the left, preventing the reflux of the water, and the induction valve ball is forced back against its guard, leaving a clear port for the column of water. To cushion the resuming action of the fluid thus drawn violently in, the vacuum chamber, already mentioned as connected with the induction chamber, comes into play; it contains air in its upper portion. A small air-check valve is screwed into this vacuum chamber, and lifts when a partial vacuum is produced therein, allowing the entrance of a small quantity of air, but closing against its return. The valve opens at each pulsation, and its lift may be regulated by a suitable screw so as to vary the quantity of air permitted to enter. As the result of these changes, the other chamber, valves, etc., are instantly brought into operation, to be in turn reversed.

Numerous advantages are claimed for the pump by the inventor, who also considers it applicable to a large variety of purposes. It is remarked that in mines the pumps are very liable to get out of order, work irregularly, and, in fact, form a troublesome part of mining economy, and Mr. Hall believes that his present arrangement is free from the difficulties inherent in ordinary apparatus. It is said to work constantly as long as supplied with steam, requires no attention, shows no perceptible wear of parts, and not to become choked by sand, wood, or mud. The patentee also states that he has successfully applied the pump at a distance of 800 feet from the water to be raised where 150 feet was clear lift: he adds that economy of steam is one of the principal advantages of the invention, in addition to the saving effected in repair and care. It is thought that the pulsometer would be useful for locomotives, where the supply of water has to be drawn from roadside streams, as in the colonies and newly settled countries; and that in addition to these it may be employed for pumping deep wells, being suspended by a chain or rope, and lowered as the work progresses; for removing water from foundations, as we are informed that it will raise fluid containing 50 per cent. of sand or mud; as a working meter, as, by knowing the exact capacity of the working chamber and counting the pulsations, the quantity of liquid moved at any time may be determined; and in fine, through its absence of complicated parts, freedom from requirements of oiling, packing, and constant supervision, for a multiplicity of other uses which circumstances will suggest.—*London Mining Journal.*

The Preece block system of electric railway signalizing is worked on the principle that the trains are to be kept a certain unvarying distance apart. No train can advance until the signal is given that the line for the specific distance ahead is absolutely clear. —*Scientific American.*

Improvements at the Pittsfield Gas Works.

We were surprised on a visit to these works, this week, to see the extent and perfection of the additions and improvements made during the past Summer and Fall; but, after examining them, were not astonished to learn that the cost will reach about $30,000. We have no doubt that our readers will be interested in a detailed account of what has been done; especially that considerable portion of them to whose comfort it promises to essentially add.

The building containing the retorts, purifiers, etc., has not been changed; but eleven retorts have been reset, and last year a powerful exhauster was added to the apparatus. In this building are also the meter for measuring the amount of gas sent into the town. A large addition has been made to the coal shed, on the land purchased from Mrs. John Faulkner. The company regards itself as fortunate in the location of this shed, which, lying along a side hill, enables the cartmen to dump the coal into it, without the cost and trouble of shovelling. Nine hundred tuns are now in store; 1300 is the average annual consumption. It comes from the bituminous fields of Westmoreland county, Pa.

The old gasholder, which was built in 1855, and has a capacity of 28,000 cubic feet, has for some time been entirely inadequate to the wants of the town. The new one will probably exceed them for a short time; the old remaining still in use. The new holder is 65 feet in diameter and 20 feet three inches deep, giving a capacity of 67,192 cubic feet. The iron sides and crown weigh four pounds to the square foot, but at the angles and the bottom are much heavier. It is a "flat-top holder" differing from the round top in ordinary use, by being made of heavier iron, and without inside frame work to support it. It will give a pressure of 2.70 inches. It was made and set up by Deilly & Fowler of Philadelphia, at a cost of $7,000; Mr. Fowler superintending the work, which is admired by all visitors for its perfection.

The tank in which the gasholder rises and falls is sixty-seven feet four inches in diameter by twenty-one feet deep, and will contain 468,012 gallons of water, weighing 2,345 tons.

The walls which line, and rise three feet above the excavation, are forty-four inches thick, diminishing at the top to twelve; of brick laid in and lined with two coatings of the best cement. The bottom is ten inches thick, and is made of cement and gravel, 760 barrels of the former being used; the materials used in the tank were 210,000 brick, 800 barrels of cement, 200 loads of sand, 376 loads of gravel. The excavation for it was made through rock and "hard pan," under the direction of that veteran in those matters, O. H. Beach, who took out marble and compact limestone enough to build the foundations of the gas house and a neighboring building, and have a considerable quantity left.

The tank and gasholder are enclosed in a fine round building of brick, 74 feet in diameter, in which 114,000 brick were used: this work, as well as that of the tank, being done under the superintendence of the experienced builder, Mr. George G. Baker, of this town. The roof of the gas house, which becomes twelve-sided, after it leaves the walls, and is surmounted by an ornamental ventilator, is considered very handsome: as indeed the whole building is. The roof was put on by R. S. Simmons of Philmont, and will cost with the slating, which is done by James McCleary, $2,200.

The new holder connects with the town by two mains—one of which was put in last summer—one running up East Housatonic street to South (partly ten inch and partly six) the other, six inch, running through Appleton avenue and East street.

We congratulate the public upon the liberal and judicious outlay which the company have made, in order to give light to the paths of the people, and that after two weeks more they will no longer be kept on short rations in that respect. "The cry of Ajax was for light," and the people of Pittsfield have echoed it

piteously on some dark afternoons this Fall; although, knowing something of the exertions the company were making for their relief, they have been very patient. Now shall patience no longer be needed. It has had its "perfect work."

We ought not to close without adding, that much of the excellence of the work is due to the indefatigable labors of the secretary and treasurer of the gas company, William R. Plunkett, Esq.—*Pittsfield Sun, November 12.*

Improved Process for Purifying Coal-Gas.

[From Proceedings of the British Association.]

Mr. Vernon Harcourt said that the usual method of freeing coal gas from sulphuretted hydrogen was by passing it through lime. But oxide of iron was also employed in place of the lime, the advantage possessed by the oxide being that while the lime, after it had served its purpose, was useless and difficult to get rid of, the oxide of iron could be used repeatedly for the same purpose.

The chemical changes involved were that, when the gas had passed through the oxide the latter was changed into sulphide of iron; when the sulphide was exposed to the air, the sulphur separated and the oxide was re-formed, thus enabling the oxide to be again used. This was called a continuous process, because the oxide could be continuously used. But the process was not quite continuous, for, after the oxide had been used some thirty times, it became so clogged with sulphur as to be useless. The new process was applicable wherever oxide of iron could be used in the purifying process.

The difference from the old process was that the oxide during revivification was moistened with a solution of ferric sulphate (persulphate of iron), and a portion of the oxide was removed from time to time, and treated as follows:

It was first extracted with water by the use of a well known arrangement. The soluble salts were sulphate of ammonia—formed in the purification by the reaction of ammonia upon ferric sulphate—and, in smaller quantities, sulpho-cyanide, hyposulphite, and probably sulphate of ammonia. This extract was mixed with a small exeess of sulphuric acid; and yielded, when concentrated by evaporation, crystals of ammonium sulphate. The remainder of the substance was then boiled with dilute sulphuric acid, which dissolved the oxide and left a residue of sulphur. The actual process of extraction by acid consisted in treating the substance successively with (1) a solution of ferric sulphate containing some free sulphuric acid; (2) with a more dilute solution of ferric sulphate to which sulphuric acid had been added; (3 and 4) with more dilute solutions of ferric sulphate—all these liquids being the product of a former extraction—and (5) with water.

The liquid resulting from the first of the treatments enumerated above was a strong solution of ferric sulphate, which was used as already mentioned, by being mixed with the charge of oxide before it was replaced in the purifier. The residue of the final washing consisted almost entirely of sulphur, and required only to be dried. It would be evident that all the oxide which had been freed from sulphate of ammonia and sulphur by this treatment passed into the condition it was replaced in the purifier. There it became again oxide by the action upon it of the ammonia in the gas, which it completely removed, fixing it as sulphate. This system had been brought into use as a manufacturing process, and had been found to be, as far as could be judged, a complete success.

Detection of Adulteration in Coffee.—J. Mueller.—In order to ascertain whether ground coffee has been mixed with either roasted corn or amylaceous substances generally, it is only necessary to treat the powder, first with dilute caustic potassa, and after filtration and addition of a large quantity of pure water, a solution of iodine is added, whereby the starch is detected.—*Dingler.*

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Mr. Cathels on Naphthaline and Tar for Fuel.

Gas Works, Montreal, Oct. 25, 1873.

Mr. Editor: In fulfilment of the promise made in my communication to your Journal of the 13th inst. (and which did not appear in the last number, I presume for want of space*), I beg respectfully to offer a few remarks on the subject treated in two of the letters in your issue of the 16th ult., viz., on "Naphthaline," by W. A. S., and "Burning Tar as Retort Fuel," by the President of the East Chester Gas Company, both being subjects with which I have (luckily or unluckily) had perhaps somewhat greater experience than either of these gentlemen.

W. A. S. could hardly have introduced a more important topic for discussion in your pages, than that of the formation and deposition of naphthaline, sometimes designated "the gasmaker's nuisance." The uncertain nature of its deposition in the pipes is graphically and correctly described; but I think he is altogether in error in his theory of its formation. It is no doubt true that there is less of it in gas made in iron retorts than when the carbonization takes place in clays, but not in my opinion from the reasons adduced.

W. A. S. ascribes the generation of naphthaline to the beginning of the distillation of a fresh charge by the rapid cooling of a clay retort, owing to its non-conducting property as compared with iron, before an equilibrium takes place between the impartation of the furnace heat and its abstraction in the interior of the retort, to lessen which difficulty he recommends the removal of shield tiles from around the retorts, "except such as experience shows to be necessary to their safety and durability." Your correspondent then proceeds to describe what he believes to be the proper treatment for naphthaline. He says that "a copious shower of cold water just as the gas enters or emerges from the condenser, seems to be very healthy for naphthaline, and frequently developes it strong and abundant. On the contrary, its introduction to a small quantity of water impregnated with ammonia, immediately after leaving the condenser seems to check its tendency to deposit."

Now, at the risk of being regarded by your correspondent, and possibly by others also, as a very gorgon of "contrariness," I am unfortunately compelled to differ from him *in toto*, in nearly all his conclusions.

The question of naphthaline has to be considered in the threefold aspect of (1) the cause of its generation; (2) the best methods of abstracting it from the gas when its vapors have unhappily got there, and (3) how to enable it to be carried forward to the burners, instead of depositing in the pipes and choking them up. Perhaps these problems cannot be solved more concisely and accurately, than in the following extract from one of the valuable lectures of Dr. Letheby, than whom there is no one more competent to speak with authority on the chemistry of gas:

"Naphthaline ($C_{20}H_8$) is only present in gas made at high temperatures, and is invariably a secondary product of decomposition of the richer hydrocarbons (tar, etc.), by the red hot retort. In London, where it is the practice to work at very high temperatures, the coal gas is always charged with naphthaline, and its presence in the mains is a serious inconvenience. The vapors of naphthaline is very rich in carbon—a cubic foot of it contains five times its bulk of carbon, and four times its bulk of hydrogen. The specific gravity of the vapor is 4·422, and therefore 100 cubic inches of it weigh rather more than 137 grains. It burns with a bright sooty flame, and if I heat a little of the hydrocarbon in a flask, and pass hydrogen gas through it, you will see how richly it naphthalizes the gas. In the act of burning, a cubic foot of the vapor consumes twelve times its volume of oxygen, sixty times its bulk of air; and it forms ten cubic feet of carbonic acid and aqueous vapor. Naphthaline is not absorbed by water, but it is by the volatile and fixed oils, and by naphtha and coal tar; hence the advantage of keeping the raw gas until it is thoroughly cooled, in contact with tar and ammoniacal liquor, in a long hydraulic main. Hence also the fact that the richer qualities of gas containing much hydrocarbon, do not deposit naphthaline, and hence also the use of naphtha as a remedy for naphthaline in the mains and service pipes. The vapor of naphthaline is absorbed by chlorine and also by bromine, the products being liquids which have considerable analogy to Dutch liquid. It is also absorbed by sulphuric acid. Naphthaline is not easily decomposed by heat; it is quickly deposited by cold, forming brilliant white scales, which have a tendency to collect in the bends of pipes, and wherever there is an impediment to the easy flow of the gas. These scales are slowly volatile at ordinary temperatures, they melt at a heat of 174° Fahr., and they boil at 428°."

My experience in the main entirely accords with the foregoing extract, as does, I may add, the experience of every English gas engineer who uses Newcastle coal. But there is one thing that appears to have escaped that gentleman's observation, viz., that the same temperature that produces naphthaline freely from the cardonization of Newcastle coal, produces much less of it from lumpy and pebbly inland coal. This I have practically proved from extensive experience of both kinds. Being an engineer and not a chemist, I will not undertake to suggest a reason, but I may mention that the coals from the inland counties are perhaps producers of richer ges than the average Newcastle ooal. There is a great difference too in their respective characters, the inland coal being lumpy or pebbly and free from slack, as compared with Newcastle gas coals, which are very fine, consisting almost entirely of dross or slack.

I am glad to be able to agree—indeed more than agree—with W. A. S., as to the desirability of abolishing all shields or guard tiles round the retorts not only "except such as experience shows to be necessary," but absolutely and entirely. I have never used such obstructions to the heating of the retorts, and I am strongly of opinion that their employment is a serious mistake. Iron retorts it is needless to say require such protection, though even with them as sparingly as possible, but with clays the practice is surely unjustifiable.

But here our opinions widely diverge. I am quite unable to subscribe to the assertion, that it is during the time of low heat in the retort, that the vapors of naphthaline are produced, and for the same reason must demur to the theory, that it is during the early part of the charge that this takes place. I am also forced to disagree in the reasoning as to the greater lowering of the heat of a clay than an iron retort.

On the contrary, the fact of clay being a less active conductor of heat than iron, would seem to be a reason for a more equable temperature in a clay than an iron retort, if it were merely a question of clay *versus* iron. This may be illustrated by the action of an ordinary English open fire grate. In the case of a "registered" grate composed entirely of cast iron, there is an excess of heat thrown out into the room, when there is a good fire burning, because we have the heat emitted by the fire *plus* that given out by the heated iron, but when the fire gets low, the room quickly cools in consequence of the iron rapidly cooling as the fire burns down. But when the sides and back of the fire place are composed of fire clay lumps, these acting as a magazine of heat, storing up a large quantity when the fire is good (and to that extent abstracting from the heat of the room), continue after the fire has got low to radiate out this surplus. And so I apprehend it is, or rather so it would be, in clay as opposed to iron retorts, if it really were a contrast between these substances, but practically it is not quite so, because the iron retorts are to a considerable extent enveloped in a certain thickness of fire clay, through which the heat has to be transmitted before reaching the iron, and the charges. Still, iron retorts cannot be safely heated up to anything like the same temperatures that clays will stand, and at which they are usually worked, without injury, and hence they (the irons), produce less naphthaline.

As Dr. Letheby explains in the above extract, and as every experienced gas engineer knows, naphthaline is a secondary product of the richer hydrocarbons through high heats, and the gas rubbing against the interior surface of the retort, above the level of the layer of coal, and is therefore more abundantly evolved *at the end, than the beginning of the charge.*

So much respecting the generation of the vapor of naphthaline, and now a word as to its absorption to prevent its subsequent vexatious choking of pipes both in the works and district supplied. W. A. S. it seems

* Correspondence alluded to appeared November 3rd.

to me (and my experience is borne out by the foregoing extract), is equally unfortunate in his statement respecting the beneficial effects of a "copious shower of cold water just as the gas enters or emerges from the condenser." This sudden cooling is well calculated to choke up the pipes in the works, but is wholly opposed to the experience of English gas managers, as to the best methods of getting rid of that nuisance.

Dr. Letheby's recommendation of keeping the gas as long as possible in contact with the tar and liquor, in a long hydraulic main, is as already stated, entirely correct in theory, but there are serious well understood practical objections to long hydraulic mains. But the advantages of the system can be easily secured without the disadvantages of the long main. The way usually adopted is to take the gas off the ends of the main in the same pipe with the liquid overflow, and continue the pipe supported against the retort house wall, on brackets, for any required distance, of course giving it a slight inclination all the way, and doubling it where necessary. This is the system I have adopted. I also prefer, and where practicable, always adopt the arranging of the retort bench into sections of six arches each, and have tho hydraulic main in two lengths over each section, each length of course taking three beds of retorts, the exit pipe being taken from the outer end of each length of main. Some engineers again, instead of running the pipe on the retort house walls, arrange the condenser horizontally, like an ordinary hot water apparatus, of course keeping the whole of the liquid products of the hydraulic main in contact all the time with the gas. This latter system has the advantage over a long run of straight piping, of bringing the gas more uniformly in contact with the liquid. The liquids flow along the bottom of the pipe, and the gas along the upper part of it, and it is conceivable that in a straight line of pipe, the stratum of gas might remain undisturbed, the lower part only being in contact with the tar, whereas the bends disturb this uniformity, and bring the different portions of the gas successively in contact with it. It will be readily understood from this, that the pipe must not be of too large diameter, admitting of a space between the gas and tar.

A few years ago I was led to adopt a still further improvement in this direction—not as a substitute for the horizontal piping, but as an auxiliary to it—by erecting a "battery condenser," that is, a structure of cast iron plates and pipes, two feet wide by eighteen to twenty feet high, and of any required length; the one I allude to was sixty feet long. The plates forming the back and front sides are pierced with holes about eight or nine inches apart, into which 3-in. horizontal pipes passing through from front to back, are fixed, open to the atmosphere at both ends, the ends being flush with the front and back plates of the structure, respectively. There are vertical division plates every four feet in the length of the condenser, which allow a gas way alternately top and bottom, thus forming oblong pipes, through which the gas successively ascends and descends as in an ordinary single pipe condenser. As there are many hundreds of the 3-inch horizontal air pipes, and as they speedily become coated with tar on their outside surfaces, the gas is tumbled about, and scrubbed against them, depositing naphthaline with the tar so freely, that I have had to dig it from the tar outlet boxes in wheelbarrow fulls.

I had intended saying a little more on this interesting subject, but seeing this communication has already run to such an unconscionable length, I must conclude for the present, hoping through your forbearance to be able to resume and finish what little I would desire to say in addition, as also a few words touching the other important topic alluded to. Yours truly,

E. S. CATHELS.

Havens's Invention—Stoking by Machinery.

NEW YORK, Nov., 14, 1873.

Mr. Editor: In reply to the letter of Mr. Cathels, published in your issue of November 3d, I would say that I appreciate the motives which prompted the writing of said letter, and believe the assurances of the gentleman that he is sincerely desirous of becoming more thoroughly acquainted with the modus operandi of my machine.

But ere I enter into explanatory details, I wish Mr. Cathels to understand that I have not for an instant attributed his criticism to a spirit of fault-finding or captiousness, but on the contrary, regard it as eminently just and proper.

That the description furnished with the engraving of the machine was not as full and complete as it might have been, I confess. This, too, has been acknowledged in the editorial notice of the letter and the omission made good to a certain extent. Lest, however, there should still exist any misapprehension in relation to the machine, I will, with your permission, Mr. Editor, enter a little more into detail than has as yet been done.

Mr. Cathels's inference that but a portion of the machine was shown in the engraving is correct. To have placed the coal hopper on the machine when the photograph was taken, would have precluded the showing of other portions, which I considered more essential to have appear. When the machine is ready for operation, the hopper is suspended on the frame to be filled from stationary bins placed above the floor of the retort house, the bins to be filled in turn from the boats—or from the pile—by means of my wire rope railway (a full description of which appeared in the *Scientific American* of September 27, 1873.)

I purpose making use of power as circumstances may dictate, either by a running rope with the bight wound round the pulley, placed at the front, or rear, as seen in the engraving, or by a simple engine which can be run by illuminating gas, or vapor of naphtha. This engine is light and cheap, and as it requires no boiler or furnace, it is particularly well adapted to my purpose, and can be applied to the shaft by either gear or belt without additional parts.

In reference to the capacity of the machine, I claim it is capable of drawing and charging four hundred and twenty mouthpieces per day, and the expense incidental to the working of the machine is a mere bagatelle.

One of the great advantages of the machine is the fact that should any part be broken, it can be replaced by a duplicate part in less than twenty minutes, thereby preventing delay of moment in the operation of the work. Another advantage is that it is adapted to works already constructed, and the expense necessary to its introduction is very trifling. When in place, it can be adjusted at the pleasure of the party in charge. The scoop then runs in the retort, dumps, reverses, runs out, and stops. These movements are entirely automatic and can be arranged to take place at any point of its travel; it can therefore be used in retorts of any length, and in old ones where the "butt" has formed.

The scoop is in the form of a half circle with solid heads in the ends from the retorts, and is hung on two journals which have square ends fitting into sockets in the ends of shafts which pass to the front, and to which the short arms are fastened. These arms are connected by links with the upper end of an upright shaft, which passes through a guide. The lower end has a wheel. The ends of the scoop near the retort are hung on one centre or journal, and are suspended from an arched piece by an eye-bolt secured by one large nut; upon the under side of the carriage is an inclined plane adjustable to any position along the carriage; the driving gear is mounted upon its own bed plate and is bolted to the end of the carriage. It consists of a horizontal shaft with a clutch on a feather, placed between two vertical wheels, which gear into a horizontal one, the shaft of which passes through a stand, and has a pinion or chain wheel upon its upper end, the horizontal shaft is driven by the pulley seen in the engraving, or by a shaft running under the carriage to the front, where the power can be applied. When the clutch is between the wheels the shaft may be be run without moving the scoop, but when thrown to the right it gives one motion to the scoop, and when to the left it reverses that motion. When the scoop has been filled with coal the clutch is thrown in gear, the scoop runs into the retort until the wheel on the lower end of the upright shaft runs up the inclined plane: as the shaft rises the links pull the short arms up and give the socket shafts a quarter revolution, which is imparted to the sections of the scoop, and as they swing round on their journals they form the upper half of the circle, thus allowing the coal to fall out through the entire length of the retort, and as the end in the retort is hung on one journal, it is larger and puts more coal to the back of the retort, where the heat is greatest. When the scoop is quite open a stop reverses the clutch, and at the same time hooks on the end of the short run in front catch, under the upright shaft, and holds it up until the scoop runs out of the retort, when the wheel on the short arm runs up the incline and disengages the hooks: the sections of the scoop fall by their own weight, at the same time moving the clutch between the wheels: and the machine is then ready to charge again.

If the above description fails to convey a clear and accurate idea of the working of the machine, I shall be happy to try again, and I hope so successfully as to leave no room for doubt or uncertainty.

Yours respectfully,

A. F. HAVENS.

A Recent Improvement in Gas-Making.

NEW YORK, November 20, 1873.

Mr. Editor: The *Scientific American* of the 15th instant contained an illustrated description of the Gwynne-Harris or American Hydrocarbon process for making gas, as now in operation in the works of the Citizens Gas-Light Company of Brooklyn, New York. But in an editorial under the above caption, in the same issue, the editor conveyed an erroneous impression as to the just claims of those who own this process. He says:

"It is a matter of general information, that the forcing of jets of superheated steam through anthracite coal, over heated metal, or through a furnace fire, is not a new idea, nor is it our intention in the present instance so to infer—some sixty patents or more have been granted for 'water gas' and kindred processes, dating as far back as 1823. The system in general has found many opponents, notably among others the late Dr. Torrey: while Prof. Wurtz, in published reports on the subject, has pointed out that it is impossible to convert the steam entirely into hydrogen and carbonic oxide. Some of the steam, he considers, is not decomposed, and passing into the coal retorts, operates injuriously, probably by oxidizing the oleifiant gas. In conclusion, the same author remarks that the greatest practical objection is the uncertainty of the quality of the product."

Now, Mr. Editor, the GAS-LIGHT JOURNAL "being the sole exponent of the literature and progress of gas-lighting in the new world," permit me, through your columns, to correct the erroneous impressions conveyed by the *Scientific American*.

It is true, that since 1823, many efforts have been made to convert water into gas, and that more than sixty patents were issued. But not one of their projectors ever succeeded in attaining their object, for the simple reason that they never discovered the only true method of perfectly decomposing the steam. They passed the steam *over* the fire, and on metallic zinc, and over red hot scrap iron, etc. But none of them ever passed the highly superheated steam, in properly distributed jets, *under and up through incandescent anthracite coal*, as is done by the process owned by this company—and besides, every one of the inventors referred to by the *Scientific American*, used iron retorts and iron pipes, or other iron apparatus for decomposing the steam—whereas it is impossible for iron to stand a heat sufficiently high to properly decompose steam into hydrogen and carbonic oxide gas—we put a plate, half an inch thick, said to have been enamelled in England, at a high heat, into a bench with clay retorts, at a heat usually used by us, and in a short time it was burned to a cinder.

William H. Gwynne, in 1862, obtained two patents, and in 1863 he obtained two re-issues, with improvements; and in 1866, 1869, 1871 and 1872, Mr. Harris, the engineer of this company, and his associates, obtained four patents, all of which are owned by this company, or by those connected with it—and the hydrogen benches in the Citizens Gas-Light Company of Brooklyn, and the remarkable results there produced, described in the *Scientific American*, show the perfection of our system, under these letters patent.

While Mr. Gwynne was engaged in February 1864, at Elizabeth, N. J., in making his exporiments, in a very imperfect manner with an iron retort, and an iron distributing pipe or box under the coal, Dr. Torrey made an examination of his process, and with the light he then had, reported to his employers, the Manhattan Gas Company, against it; and you also, Mr. Editor, made a report on the subject of water gas,

as stated by the *Scientific American;* both of which reports were published by the Manhattan Gas Company in pamphlet form, and widely circulated, with the evident idea, on the part of that company, that all interference from that source, with the old, wasteful method of making gas, was forever abated.

But the fact, Mr. Editor, that you, in 1869 (five years afterwards) being associated with Prof. Silliman in making a thorough examination of our process, as then improved, joined in making the ablest report, *in its favor*, ever published in this country on the subject of gas, should prevent any one from quoting you as against the system, because in 1864 you found all of the earlier and crude experiments unsuccessful. For your present opinion we beg to refer your readers to your editorial in the GAS LIGHT JOURNAL of 3rd, November, inst., in which you say, "So far as our present lights go, it seems as if we would have to settle down for a cheap and effective dilution of our petroleum gas, upon that much scorned and maligned product 'water gas.'"

By our process, as now perfected, every particle of steam is decomposed, and there is no longer any objection whatever, on account of "the uncertainty of the quality of the product." It is the most certain and regular in its operation, of any other mode of making gas, and as we have continually, for six years, been assured by those who "are wise above what is written," that we never could succeed, we do not like now to be waived aside, by the assertion that our invention is nothing new.

It was reported not long ago in England, that hydrogen was made there, but it cost five shillings ($1 25) per 1000 feet, while under our process, 50,000 feet of gas is made per day from each bench, at a cost actually less than twenty cents per 1000 feet: and we expect soon to show that, with oil for illuminant, the most perfect and permanent gas ever made, of high candle power, can be produced in large quantities, at a small advance above the last named cost.

The full description, in the *Scientific American*, of the use of hydrogen, in conjunction with common coal gas, renders it unnecessary for me to say anything on that subject. At present, where wood is expensive, there is no proper substitute for coke as fuel, and it is therefore neceesary for every company to run as many coal benches as are required to produce sufficient coke for their own works. But the gas from every ton of bituminous coal carbonized beyond that, costs them five or six hundred per cent. more than if they made the additional quantity wanted, under our process.

If the Citizens Gas Company of Brooklyn should, as I presume they will soon find it to their interest to do, put up four additional hydrogen benches, so as to make 300,000 feet of gas, instead of 100,000 feet as at present, under our process, and abandon altogether the use of atmospheric air, which in any form, is exceedingly deleterious to gas, they could produce the cheapest and best gas of any now furnished by any company in the United States. The President of that company, within a few days, said that our two benches there "are working beautifully."

H. P. ALLEN,
President National Coal Gas Company,
4 Warren street, N. Y.

[Some editorial remarks on the above subjects will appear in our next issue. Mr. Allen's letter reached the Editor at so late a day, that no room remained in this issue.—H. W.]

Cannelite—A Correction.

BROOKLINE, MASS., NOV. 25, 1873.

Mr. Editor: In your issue of November 46th, either the types or illegible writing, altered the expression of the comparative values of Albertite, Cannelite, and Boghead coal, as materials for enriching ghs, produced from gas-coals of poor quality.

After stating that these substances enrich gas, by affording the same illuminants, of a permanent character in relation to cold, the relative value of each was deduced from the weight of the volatile gas forming material in each. Thus:

Boghead Coal, 62; Albertite, 61; Cannelite, 45.

Or roughly, Cannelite is of three-fourths the value of Albertite, as it consists of Albertite mixed with the silt of sandstone.

The *cost* of Cannelite in the market may be even less than that of ordinary coal, and with the disadvantage that it affords no coke, and must be worked apart from other coal, it probably offers the greatest economy in illuminating gas. A. A. H.

Illuminating Gas from Crude Petroleum.

To the Editor of the *Scientific American:*

As you are happy to chronicle any new facts, let me make a statement of what has been done at our mill at Passaic, N. J., since January, 1871, when we had works erected for us, by Dr. W. C. Wren, of Brooklyn, N. Y., for the manufacture of illuminating and heating gas from crude petroleum. The works are the invention of Dr. Wren, and we have ever since been using them to light our mill (which we run all night) with the following results:

First, we use crude petroleum (which is quoted at six cents per gallon) and make a fixed permanent gas of eighty candle power. Secondly, we have no difficulty in making the gas. Thirdly, we make, on an average, more than four thousand feet of gas of the above candle power from one barrel of crude oil, which we use through a burner consuming one foot per hour and one foot and three tenths per hour. The barrel of crude petroleum, at the rate of ten cents per gallon, costs us, when made into gas, seven dollars; that is, in practice, it costs us seven dollars for four thousand feet of petroleum gas that goes farther and gives us a better light than seventy dollars worth of coal gas at three dollars and a half per thousand. The above is the result in actual practice.

If we used coal gas, we would want five feet and six feet burners for the same light we now get with a one foot and a one and three tenths feet burner. We have now had the works in steady and constant use for more than two years and a half. This is no "statement of the inventor," but plain indisputable fact by a consumer.

The retort for making the gas is a simple contrivance, and is not given to choking with carbon, as you seem to think probable. It is so simple and easy to run that we take any man out of the mill and set him at it.

At some future time (not to use more of your space at present) I will give you some of the results of heating with petroleum gas. MILES WATERHOUSE,
Superintendent.

52 and 54 Murray Street, New York city.

REMARKS BY THE EDITOR OF THE *Scientific American*.—We are glad to make public the excellent practical results here given for the Wren process, which is evidently a discovery of much importance. The apparatus employed involves, we believe, the employment of a series of chambered retorts, through which the oil is slowly passed.

Petroleum-Gas Patent.

The *American Artisan* gives an abstract of a patent recently granted to William H. Sterling, San Francisco, Cal. The nature of this invention relates to the manufacture of illuminating and heating gases from coal-tar and petroleum, by mixing or compounding them with the non-conducting, incombustible, infusible substance (finely-powdered ashes), and in mixing at the time of combination, with the coal-tar and petroleum, a sufficient quantity of water to afford, by its decomposition (simultaneously with the hydrocarbon liquids) into its elements of hydrogen and oxygen, these necessary gases for combination with the carbon elements to form the lighter carbureted-hydrogen gases, such as marsh-gas and olefiant gas with the hydrogen, and carbonic oxide with the oxygen; the heavier carbonaceous compounds, such as naphthaline, paraffine, etc., being broken up in the distillation, and a certain portion of their carbon elements being retained by the non-conducting incombustible substance (ashes), as pure carbon or coke, while the lighter hydrocarbon gases are driven off. At the same time, by the simultaneous decomposition of the carbon compounds and the water, certain other portions or particles of carbon are combined with the hydrogen and oxygen of the water, forming the lighter carburetted-hydrogen gases and carbonic oxide.

In order that the invention may be comprehended, we give the following methods as being such as can be successfully applied to the manufacture of illuminating and heating gases.

Any convenient quantity of crude petroleum is taken, and to it are added about 10 to 20 per cent. of its bulk of water, the quantity of water added depending upon the gravity of the petroleum, the heavier requiring the greater amount of water. The two liquids are placed in a suitable vessel provided with appropriate means for a thorough trituration or emulsion—one supplied with stirrers or beaters, as, for instance, a barrel-churn—so that a most intimate or atomical mixture may be obtained of the petroleum and water. In order to facilitate this emulsion, two to five per cent. of caustic lime of the weight of water, may be added previous to the agitation or during its continuance; the exact amount of caustic lime used also depending upon the gravity or richness in carbonaceous elements. After thus thoroughly mixing the two liquids, the mixture is run into a vessel containing very finely powdered ashes, and the compound is mixed or ground thoroughly together, to a consistency dry enough to be molded or handled in compact masses; the kind of vessel used for compounding the ashes with the liquids being a description of mill with a grinding or mixing cylinder, similar to an ordinary paint-mill. When the compound has thus been carefully and completely mixed, it is transferred in compact masses to an ordinary gas-retort, and thenceforward the proceedings are in the usual manner for making coal-gas. The compound may be either molded in blocks of suitable large size, or placed in large perforated clay molds, and thus transferred to the retort. In the distillation of coal-tar the inventor proceeds to prepare the compound in a similar manner as above described, using a larger percentage if the tar is free from water, or a smaller amount than in the case of the petroleum if the tar already contains contains considerable water, as is often the case in some instances. Thus the proportions would be about 20 to 30 per cent. of water, including the amount of water already in the tar in mechanical suspension, and not as a chemical combination.

The amount of caustic lime which may be added to facilitate the emulsion, as described, would be about five to ten per cent. of the weight of water, the emulsifying or atomically mixing the coal-tar and water, and the compounding of the mixed liquids with the powdered ashes, being the same as above described method of mixing the crude petroleum. The compound is then molded in compact masses or blocks, or placed in the perforated clay molds, as above described, and transferred to an ordinary gas-retort and distilled, as above described.

Southby's Economic Gas Ranges and Roasters.

In our notice of the Gas Cooking Apparatus at the International Exhibition, in the Journal of July 29, no mention was made of these inventions, the omission arising from the fact that they are not placed with other apparatus of the same class, but are to be seen in operation at the entrance of the School of Cookery. The special feature of the inventions, and in which they differ from other apparatus for gas cooking, is the arrangement by which the gas is burnt in a chamber or chimney, the lower end of which is left entirely open, while its upper end delivers a highly heated current of air into the oven or range containing the articles to be cooked.

The advantages which the inventor claims for this arrangement are the following:

1. The gas being burnt in a strong current of fresh air, the combustion is perfect.

2. The heated air escaping only at the bottom of the vessel instead of, as in other apparatus, at the top, it is that portion which has given out its heat to the articles in process of cooking that escapes instead of the hottest and unused portion, thus producing a greater economy of gas.

3. The meat always being cooler than the air by which it is cooked, it is surrounded by a descending

current, which, the exit being at the bottom, escapes freely; whereas if the exit was at the top it could only eddy round and round.

This causes the great bulk of the air admitted into the apparatus to pass immediately over the surface of the meat, carrying away with it all the vapors given off as fast as they are produced, thus ensuring the same perfect ventilation as before an open fire, and preventing any possibility of the disagreeable flavor of an oven-cooked meat. An incidental advantage of the even temperature secured by having only a bottom exit for the air, is that all the space in the apparatus is available for cooking, which makes it an unrivalled oven for baking pastry.

As the burner which is employed consists of the common fishtail jets, it cannot be lighted in the wrong place, as the atmospheric burners are liable to be even in the most experienced hands, thereby causing imperfect combustion and offensive smells, and its isolated position in a chimney prevents the gravy falling upon it and both choking the burners and producing the smell of burnt fat. By the same means so large a volume of pure hot air is forced through all parts of the apparatus that a larger amount passes over the meat than even before an open fire.—*Journal Society of Artt.*

The Atlantic Cables.—The attempt of the Great Eastern steamer to lift and repair the Atlantic ocean cable of 1868 has failed, owing to stormy weather, and the great ship has returned to England. The work is postponed until next year. The fault has been located at a point not far eastward of the banks of Newfoundland. The cable was successfully grappled and lifted several times. A portion of the original cable, that of 1858, was brought up during the grappling operation, and found to be in a fair state of preservation.—*Scientific American.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

DECEMBER 2, 1873.

DELIVERED IN NEW YORK.

English Cannel.			
Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00
English Caking Coals.			
Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00
British Province Coals.			
International—At Sydney, $2 50 in gold			— —
Block House—At Mines, $2 50, Gold			0 00
Little Glace Bay—At Mines, 2 50 Gold			— —
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☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

MONDAY, DECEMBER 2, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 11 and 121 Nassau street, New York agents for this Journal. News dealers will please send orders to them.

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TO OUR SUBSCRIBERS AND PATRONS.

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A CORRECTION.

The Editor having been absent much of late, has had no opportunity before to call attention to an important error in the Report of the Proceedings of the Gas-Light Association, as received from the Publication Committee. The following extraordinary passage is referred to:—"the unfortunate omission to properly announce by a notice in this paper the exact time and place of holding the meeting in this city."

Doubtless most readers have observed the error here involved, as regards announcement of the *time*. In the issue of 2d of May last, the Report of the Minutes of the preliminary meeting closed up as follows: "the third Wednesday in October, 1873, at 10 A. M., at such place as may be designated *by the President*."

This announcement seems circumstantial enough. If not "properly" made it is hoped that the gentlemen of the Publication Committee will point out the impropriety. See also, as to the *time*, a "Circular," headed "Important," on the Editorial page, July 2d, in which the time is stated, as the "15th of October next," a Circular sent separately to all the Gas Companies, and many other parties, throughout the United States. August 2d there was another editorial mention of the time. October 2d, a leading editorial was addressed "To the Gas-Fraternity," giving all possible information (then available), and mentioning the day of meeting in the first sentence.

Up to that date, no *place* of meeting having been found and "designated by the President," and that gentleman being debarred from doing so by lack of time, the writer *volunteered* to seek out a suitable place himself, and by sacrificing professional occupations, succeeded in making an arrangement which met the sanction of the President. In the October 2d issue it was necessary to make some provision, in view of the impossibility of announcing the *place* of meeting. A Circular was therefore inserted (editorially) setting forth the Astor House as a place of *rendezvous*. This met the approval of the President, and also of Mr. Price, of Cleveland, 2d Vice President, whom the writer had an opportunity to consult personally. Nothing better, in fact nothing else, could have been done.

The above calm statement of facts will no doubt suffice to induce a withdrawal by the three gentlemen composing the Committee of Publication, of the mistaken imputations against this journal and its editor, conveyed in the sentence we have quoted from their report of the meeting last month.

MR. PATTERSON'S SULPHUR PURIFICATION.

The controversy between this gentleman—late a member of the first London Board of Gas Referees—and certain English Gas Engineers, backed by the London *Journal of Gas-Lighting*, is still in progress, and at times assumes an acrimonious cast. Many gentlemen of the profession, throughout Great Britain, still evidently adhere to the traditions of the elders, according to which a patent is a thing to be avoided and tabooed, to be looked on as

Monstrum horrendum, informe, ingens, cui lumen ademptum;

until "proof strong as holy writ," popular clamor or legislative action, forces its adoption; when the invention is coolly appropriated, the patent magnanimously ignored, and the inventor left to while away his time in litigation

"To the very verge of the churchyard mould,"

Such was the shameful record of the Hills iron purification invention, and of others. Let us hope that this prejudice is dying out. It is certain that members of the profession do not themselves hesitate to make application for patents for what they deem to be meritorious inventions in their art both in Great Britain and the United States; and that this is a growing practice in both countries. None of the ancient prejudice can long maintain itself under these circumstances.

It would appear, however, that in the case of Mr. Patterson, another kind of influence is also at work, namely class-prejudice, or professional pride, that gentleman not being a professional gas-expert. On this we have little to say, as we take no particular interest in it. It is a many-times-told tale that most valuable inventions in many arts are and have been made and perfected by those whose daily pursuits were separated, almost *toto coelo*, from said arts.

Mr. Patterson seems to be a man who is held in high respect personally, even by those who ridicule and vituperate his claims to originality in gas purification. It is only within a few weeks that we have learned that he is now "a brother of the quill," being, we believe, the managing editor of a new daily journal, a "penny paper," the Glasgow *News*, which has all at once (in about two months) attained a circulation surpassing that of the London penny paper *Pall Mall*.

Having read all on the subject as yet encountered, we have as yet no reason to modify the opinion expressed on a former occasion, that, although, as everybody knows, lime first converted into sulphide of calcium has been unconsciously used for a long time to absorb bisulphide of carbon from gas, yet before Mr. Patterson made his experiments (while on the Board of Gas Referees) and wrote out his specifications (see this Journal, Jan. 16, 1873, p. 23; and the issues following), the whole subject was only empirically understood: and that Mr. P. was the first to apply and use the principle with understanding and purpose, so as to make it a manageable and reliable thing, in other words, an invention properly so-called.

We understand that these patents have been secured in this country also, but—though the time will doubtless soon come when we shall have to inquire into these things on this side the water—we fear that this time is not quite ripe. In fact, there is probably no large Company as yet, in this country whose gas is regularly and systemically tested—or even tested at all—for sulphur in this hidden form of bisulphide of carbon.

One tolerably strong reliance Mr. Patterson can have in this country, which we fear is yet too weak in his own:—Namely, he can rely upon Courts and Juries, and upon general public opinion, to sustain promptly his well-founded rights to originality in practical and systematic success, and therefore to his patent rights, spite of any combination of capital, however strong.

CATHELS'S "GAS CONSUMER'S MANUAL."

This work, which was noticed in our issue of August 16th last, has since received from us a careful examination, which it has well repaid. In the next number we will present a few extracts, as samples of its contents and style. Mr. Cathels thinks that previous treatises of this class have been written more for prospective, than existing consumers—with a view to increase the number of the latter, rather than instruct them

in the best ways of using gas. This said object he believes he has kept successfully in view in the present work. He moreover suggsts that what he has set forth may not be new or interesting to those familiar with making gas, for whom—he says—it was not written, but rather for those who consume gas. He also modestly intimates that his residence on this side of the Atlantic has not been long enough to familiarize him with American forms of apparatus, particularly of burners, and fixtures generally, and promises in future editions to remedy such defects.

In none of which suggestions, suspicions, and intimations of Mr. Cathels can we—as we are happy to say, after reading the book—fully concur. No man, however familiar with gas, can take up this little work and willingly lay it down again without finishing it, or deny that he has had conveyed to him, if not novel facts, at least new and suggestive ideas. Our advice to the whole profession would be to procure the book and read it. Such gas-consumers as shall exercise the necessary patience, and study the book—as all men must study somewhat to comprehend anything that is new to them, no matter how clear and simple the language and illustrations may be, as there is *not* any "royal road to learning"—will also find their reward.

Our present object, however, is to recommend the treatise of Mr. Cathels as a valuable addition to the library of *any man* who makes gas a study.

The book contains many handsome illustrations.

It is for sale by the Publishers of this Journal.

[Price for single copy, 50 cents—when ordered in quantities of 25 or more copies, 30cents.—PUBLISHERS.

PROF. PICKERING'S "ELEMENTS OF PHYSICAL MANIPULATION."

Hurd & Houghton, 13 Astor Place, New York. This is a practical manual, intended to teach the use of all instruments of precision, for measuring lengths, times, volumes, weight, light, heat, etc., with exactitude. In all these things a scientific gas man, indeed all gas-men who wish to keep up with the age, must be familiar. Prof. Pickering's book will furnish them the best—we may say, the only—means of getting such knowledge outside of the laboratory of instruction, in a collected and condensed form. Every man in the gas profession should have it in his library for reference on occasion, and in fact for careful and attentive reading.

To illustrate, we will cite some of the subjects which are treated—Use and Testing of Thermometers—Calibration of measuring vessels and instruments of all kinds—testing and use of balances and weights—handling, measurement and decanting of gases—laws of tension, deflection, torsion, etc—taking specific gravities of solids, liquids and gases—laws of flow of liquids and gases—gas-holders—gas-meters—barometers—photometers—and a multitude of other things, all condensed into the compact compass of 225 pages. The book has many illustrations.

AN OMISSIOM.

By special letter from L. A. Ward, Esq., President of the Rochester Gas-Light Company, we find we have omitted to include that company among those quoted for 1849, as since that year the citizens of Rochester have been supplied with gas. Hence, we trust, they will accept our apology.

Where to get Street Lamps.

The new "Boulevard" Street and Park Lamps, which after a careful trial, were adopted by the city of New York the past year, and which are now being edopted generally by the cities of all the States, can be had in either of the three styles upon application to J. W. BARTLETT at the General Office

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"P. J. SALMON, Sup't Gas Works."

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FROM REPORT OF
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It has a *double* semitransparent top with an intervening air space, which keeps the top cool, and prevents that breakage of glass so prevalent in other Street Lamps, and by the arrangement of its drafts more complete combustion is produced, and a greater amount of light is obtained from a given quantity of gas. Its semitransparent Reflector transmits sufficient light to illuminate the upper portion of surrounding buildings, and reflects the light where it is wanted, around and below. It also shelters the heated glass globe from rain, hail, and snow, and prevents breakage. It is peculiarly well adapted to display Street Names. Its arrangement and facilities for cleaning are excellent. It possesses decided advantages over other Street Lamps, and its tasteful design, in connection with its moderate cost and the durability of its construction, commend it as an article for general street and other uses.

By order of the Committee.
D. S. HOLMAN, Actuary.

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ATLANTIC CITY, August 20 1879.

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(Signed by the Mayor and every Member of the City Council.)

We the undersigned citizens of Atlantic City, having Dyott's Patent Street Lamp at our Hotels, fully concur in the recommendation of the same by our Mayor and City Council hereto annexed.

WILLIAM G. BARTLETT
ALBERT BROTHERS,
BARCLAY S. SMITH,
CHARLES PALMER.

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JUST PUBLISHED.

A REVISED AND ILLUSTRATED REPRINT, WITH ADDITIONS, OF THE PAPER ON

Retort Setting & Working,

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"The first paper read was on the Setting and Working of the Retorts, by Mr. E. S. Cathels of the Crystal Palace District Gas Works. This was an exhaustive, and to Gas Managers, an invaluable paper on the apparatus used in one of the most important processes in the manufacture of gas. It is a subject to which the author is well known to have given special attention, and we therefore commend his paper to the careful notice of those of our readers who are interested in the production of gas."—From a leading article in "Engineering" on 10th June, 1870. 345

Retort Settings.

Mr. Cathels is prepared to supply Tracings of Detailed Working Drawings of his Improved Retort Settings (from one to nine Retorts in a bed), adapted for either Coke or Tar as fuel, showing Plans, Transverse and Longitudinal Sections and Elevations, easily understood by any Retort Setter or Bricklayer. These Settings are excellent gas producers, with great economy in fuel. For terms, etc., apply th E. S. CATHELS, Gas Works, Montreal, Canada.

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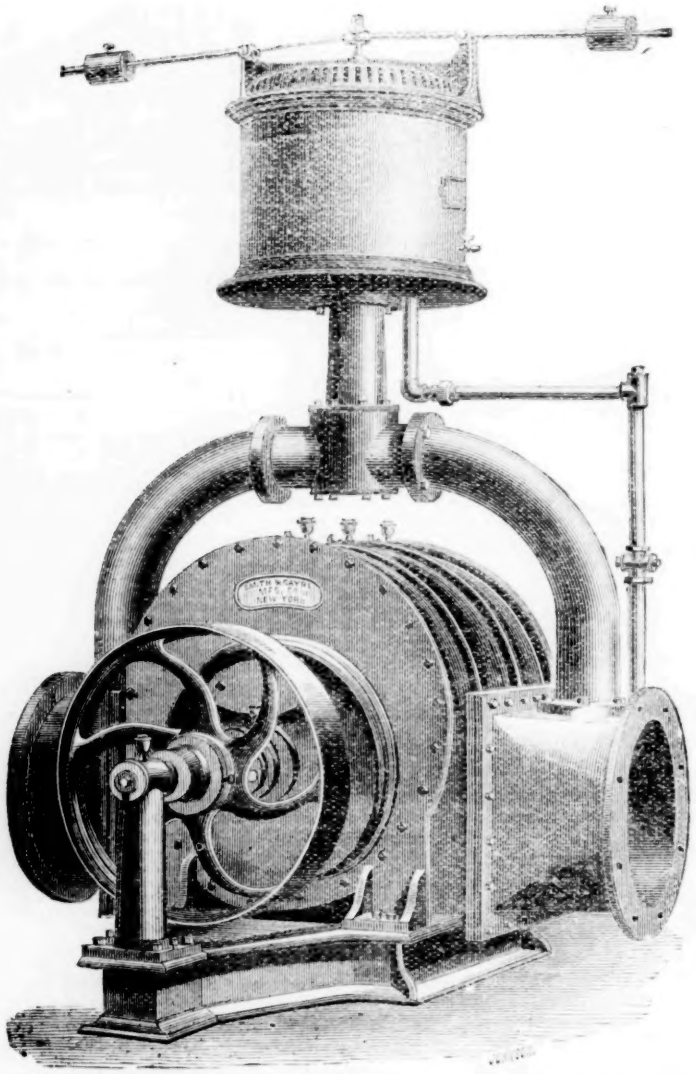

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Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any ther now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why ey will not last for a long time. The *very large amount of space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were ganges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 2, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL, Secretary.

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Address **A. P. JAQUES, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass

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Orders for fitting up Valves of any desired form or patent, *subject to the generality of the Gibson claim*, and also for SUPPLIES and MATERIALS of every description required for the use of Gas Light Companies promptly attended to by

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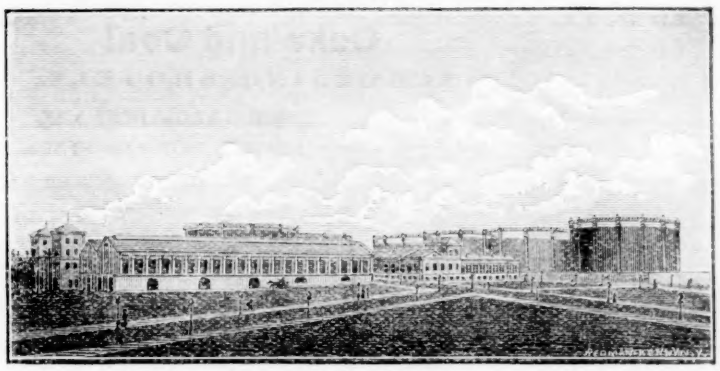
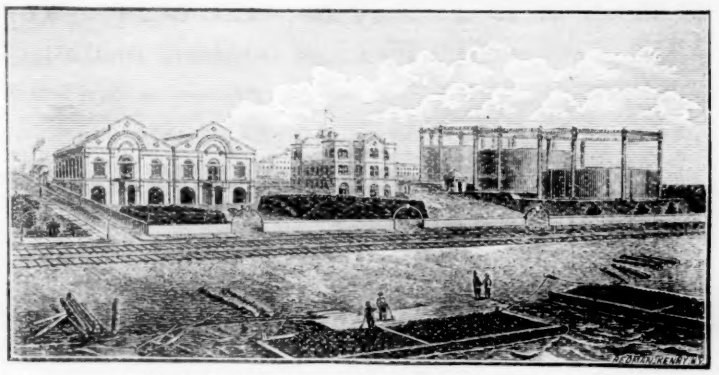
REFERENCE.—RICHARD MERRIFIELD, Esq., late Vice President MANHATTAN GAS-LIGHT COMPANY.



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM. FARMER, ENG.



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Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

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☞ Immediate arrangements are urged, as the demand for e prepared composition is increasing *so rapidly* that delays supply may occur.

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OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

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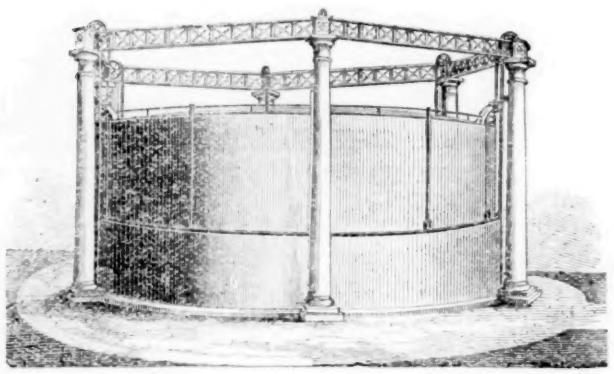

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OFFICE OF

THE GAS-LIGHT CO. OF AMERICA,

C. K. GARRISON, President.
E. W. McGINNIS, Secretary and Treasurer.
JOHN P. KENNEDY, Chief Engineer.
LEONARD D. GALE, Consulting Chemist.

GENTLEMEN: We beg leave to inform you, that we have purchased the Patent process for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

and we are now prepared to treat with you for the use of said process by your Company.

We are also prepared to contract for putting said process into successful operation in your works, furnishing all the necessary plans, materials, and workmen for that purpose.

We do not deem it necessary to enter upon a detailed description, here, of the processes above referred to, deeming it sufficient to state, to secure your interest and investigation, that they have been in successful operation, for months, in a number of Gas-Light Works in the United States, and are now being introduced in the works of the Mutual Gas-Light Company, of New York City; the Citizens' Gas-Light Company, of Brooklyn; the New Orleans, San Francisco, and very many other Gas-Light Companies throughout the country.

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37-3m

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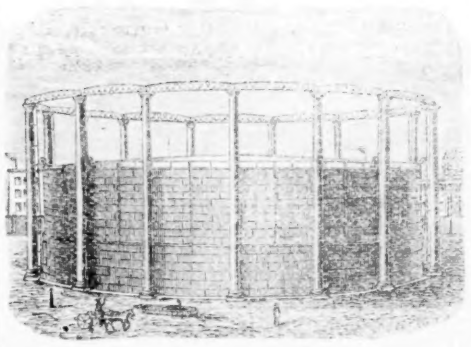

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252-1y

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Company's Office, No. 52 S. Gay Street, Baltimore, Md.

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It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

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The best dry coals shipped, and the promptest attention given to orders. 224-1y.

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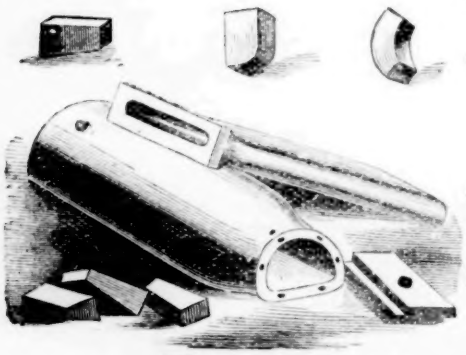

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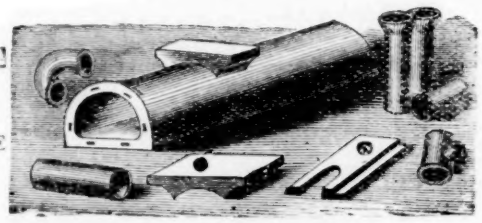

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We hereby caution all parties against making, vending, or using any GAS EXHAUST GOVERNOR that will be an encroachment of our patent.

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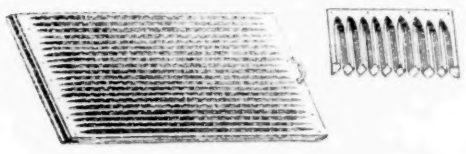

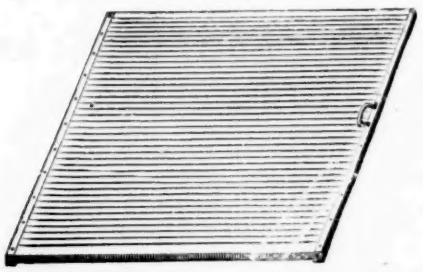

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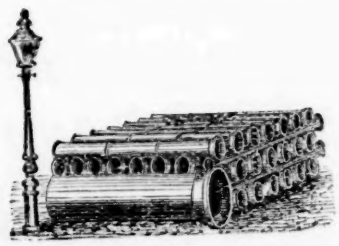

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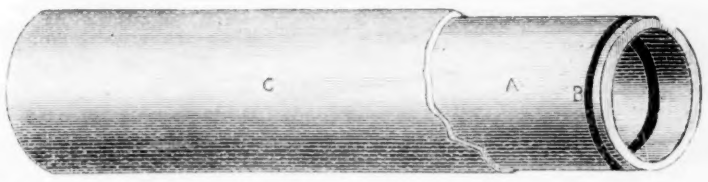

FIG. 2.

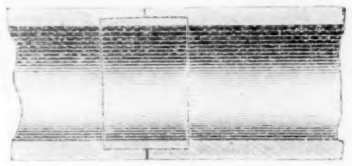

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

Above is a cut of the

"WYCKOFF PATENT IMPERISHABLE GAS PIPE,"

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This Pipe is made of White Pine, one inch to sixteen inches bore, in sections eight feet long rounded in a lathe, coated inside and out with Asphaltum, connected with a tenon, or socket, and a thimble joint, perfectly air and water tight, being driven together with cement furnished by the Company. When laid its cost is about one half that of Iron Pipe, and is UNQUESTIONABLY the best Gas conducting Main in use.

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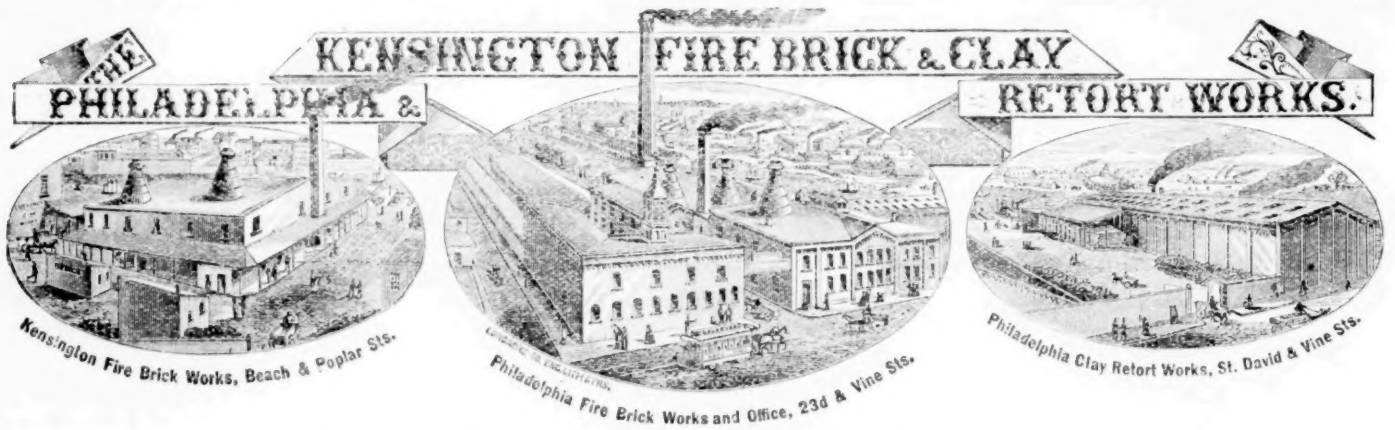
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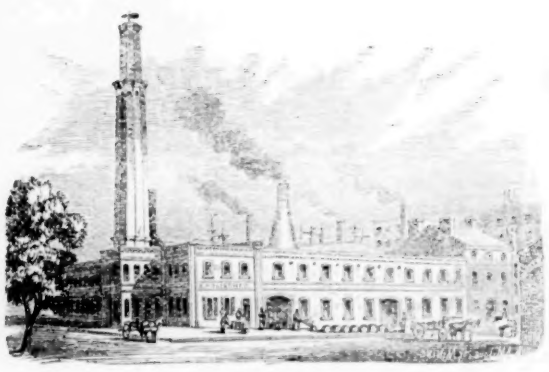

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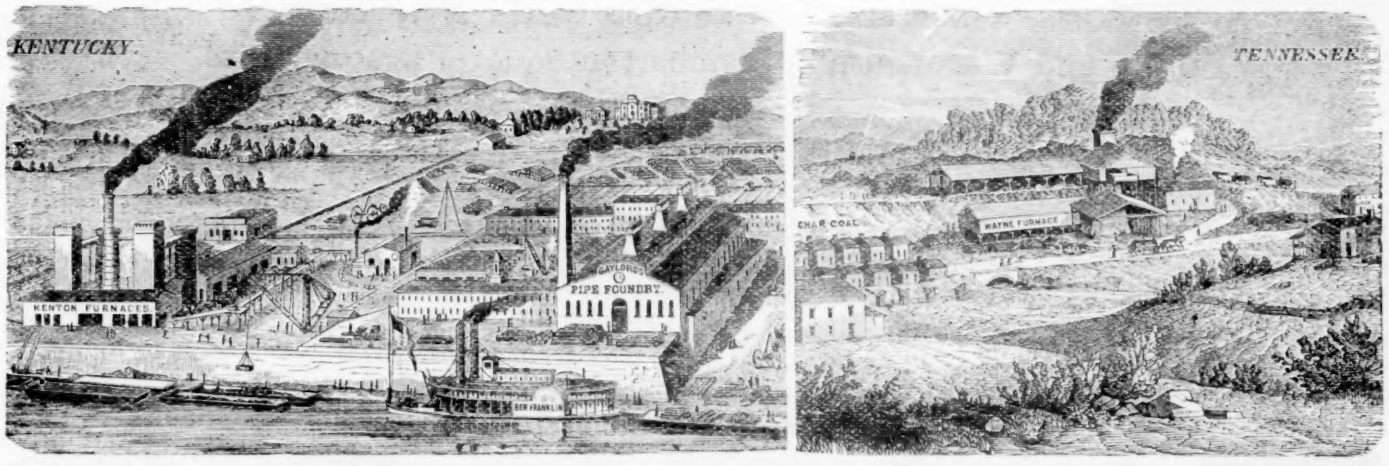

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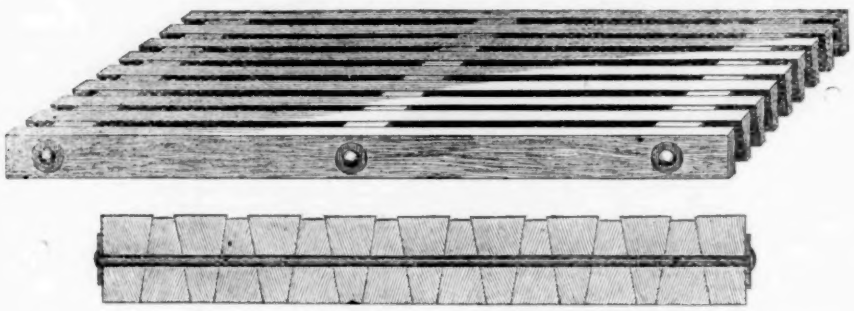
GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Patent Ash Lime Trays.



In use at the following Gas-Light Companies:

Pittsburg Gas Company, Pa.
Peoples Gas Company, Baltimore.
Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
Albany Gas-Light Company, N. Y.
Schenectady Gas-Light Company, N. Y.
Utica Gas-Light Comwany, N. Y.
Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.

New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas-Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio.
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas-Light Company, Ohio.

Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Honston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
Middletown Gas Company, New York.
Washington Gas-Light Company, Pa.
Princeton Gas-Light Company, N. J.
Newark Gas Company, Ohio.
Pontiac Gas-Light Company, Mich.
And numerous other Companies.